infrared (IR) backlighting over the display surface **24**. The assembly **22** employs machine vision to detect pointers brought into a region of interest in proximity with the display surface **24**.

[0054] Assembly **22** is coupled to a master controller **30**. Master controller **30** is coupled to a general purpose computing device **32** and to a display controller **34**. The general purpose computing device **32** executes one or more application programs and uses pointer location and gesture identification information communicated from the master controller **30** to generate and update image data that is provided to the display controller **34** for output to the display unit so that the image presented on the display surface **24** reflects pointer activity. In this manner, pointer activity proximate to the display surface **24** can be recorded as writing or drawing or used to control execution of one or more application programs running on the general purpose computing device **32**.

[0055] Imaging devices **40**, **42** are positioned adjacent two corners of the display surface **24** and look generally across the display surface from different vantages. Referring to FIG. **2**, one of the imaging devices **40** and **42** is better illustrated. As can be seen, each imaging device comprises an image sensor **80** such as that manufactured by Micron Technology, Inc. of Boise, Id. under model no. MT9V022 fitted with an 880 nm lens **82** of the type manufactured by Boowon Optical Co. Ltd. under model no. BW25B. The lens **82** provides the image sensor **80** with a field of view that is sufficiently wide at least to encompass the display surface **24**. The image sensor **80** communicates with and outputs image frame data to a first-in first-out (FIFO) buffer **84** via a data bus **86**. A digital signal processor (DSP) **90** receives the image frame data from the FIFO buffer **84** via a second data bus **92** and provides pointer data to the master controller **30** via a serial input/output port **94** when one or more pointers exist in image frames captured by the image sensor **80**. The image sensor **80** and DSP **90** also communicate over a bi-directional control bus **96**. An electronically programmable read only memory (EPROM) **98**, which stores image sensor calibration parameters, is connected to the DSP **90**. The imaging device components receive power from a power supply **100**.

[0056] FIG. **3** better illustrates the master controller **30**. Master controller **30** comprises a DSP **152** having a first serial input/output port **154** and a second serial input/output port **156**. The master controller **30** communicates with the imaging devices **40** and **42** via first serial input/output port **154** over communication lines **158**. Pointer data received by the DSP **152** from the imaging devices **40** and **42** is processed by the DSP **152** to generate pointer location data and to recognize input gestures as will be described. DSP **152** communicates with the general purpose computing device **32** via the second serial input/output port **156** and a serial line driver **162** over communication lines **164**. Master controller **30** further comprises an EPROM **166** storing interactive input system parameters that are accessed by DSP **152**. The master controller components receive power from a power supply **168**.

[0057] The general purpose computing device **32** in this embodiment is a computer comprising, for example, a processing unit, system memory (volatile and/or non-volatile memory), other non-removable or removable memory (eg. a hard disk drive, RAM, ROM, EEPROM, CD-ROM, DVD, flash memory, etc.) and a system bus coupling the various computing device components to the processing unit. The computing device **32** may also comprise a network connection to access shared or remote drives, one or more networked computers, or other networked devices. The processing unit runs a host software application/operating system which, during execution, provides a graphical user interface that is presented on the display surface **24** such that freeform or handwritten ink objects and other objects can be input and manipulated via pointer interaction with the display surface **24**.

[0058] During operation, the DSP **90** of each imaging device **40**, **42**, generates clock signals so that the image sensor **80** of each imaging device captures image frames at the desired frame rate. The dock signals provide to the image sensors **80** are synchronized such that the image sensors of the imaging devices **40** and **42** capture image frames substantially simultaneously. When no pointer is in proximity of the display surface **24**, image frames captured by the image sensors **80** comprise a substantially uninterrupted bright band as a result of the infrared backlighting provided by the bezel **26**. However, when one or more pointers are brought into proximity of the display surface **24**, each pointer occludes the IR backlighting provided by the bezel **26** and appears in captured image frames as a dark region interrupting the white bands.

[0059] Each image frame output by the image sensor **80** of each imaging device **40**, **42** is conveyed to its associated DSP **90**. When each DSP **90** receives an image frame, the DSP **90** processes the image frame to detect the existence of one or more pointers. If one or more pointers exist in the image frame, the DSP **90** creates an observation for each pointer in the image frame. Each observation is defined by the area formed between two straight lines, one line of which extends from the focal point of the imaging device and crosses the right edge of the pointer and the other line of which extends from the focal point of the imaging device and crosses the left edge of the pointer. The DSP **90** then conveys the observation (s) to the master controller **30** via serial line driver **162**.

[0060] The master controller **30** in response to received observations from the imaging devices **40**, **42**, examines the observations to determine observations from each imaging device that overlap. When each imaging device sees the same pointer resulting in observations generated by the imaging devices **40**, **42** that overlap, the center of the resultant bounding box, that is delineated by the intersecting lines of the overlapping observations, and hence the position of the pointer in (x,y) coordinates relative to the display surface **24** is calculated using well known triangulation as described in above-incorporated U.S. Pat. No. 6,803,906 to Morrison at al. The master controller **30** also examines the observations to determine if pointers interacting with the display surface **24** are being used to input gestures.

[0061] The master controller **30** in turn outputs calculated pointer positions and gesture information, if a gesture is recognized, to the general purpose computing device **32**. The general purpose computing device **32** in turn processes the received pointer positions and gesture information and updates image output provided to the display controller **34**, if required, so that the image presented on the display unit can be updated to reflect the pointer activity. In this manner, pointer interaction with the display surface **24** can be recorded as writing or drawing or used to control execution of one or more application programs running on the general purpose computing device **32**.

[0062] When a single pointer exists in image frames captured by the imaging devices **40**, **42**, the location of the pointer in (x, y) coordinates relative to the display surface **24** can be readily computed using triangulation. When multiple